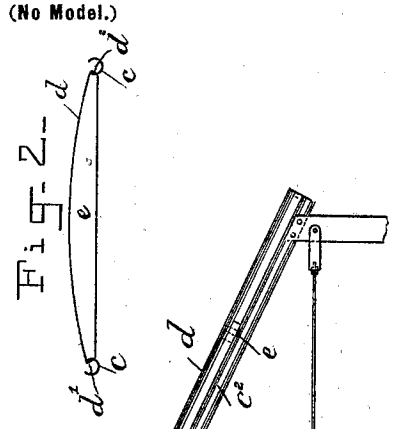
No. 624,857. Patented May 9, 1899.

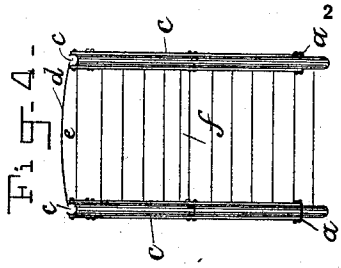
E. L. PEASE.

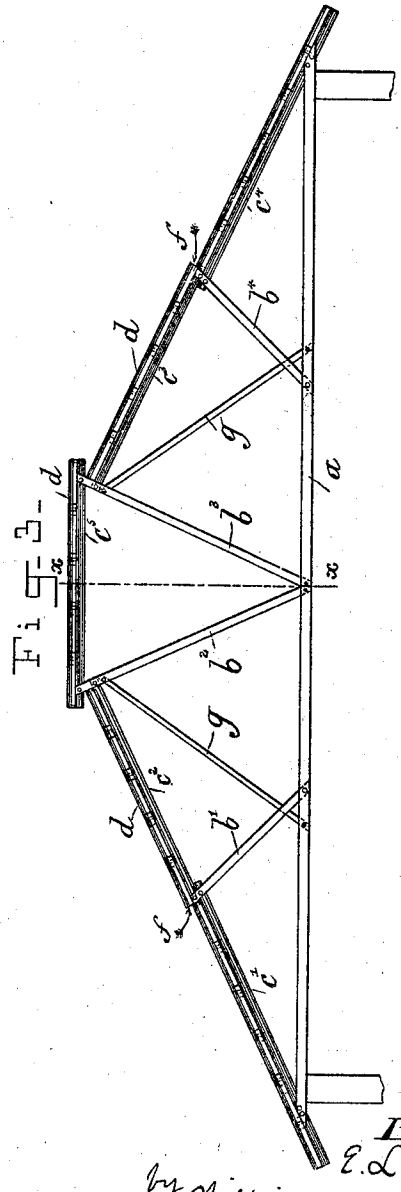
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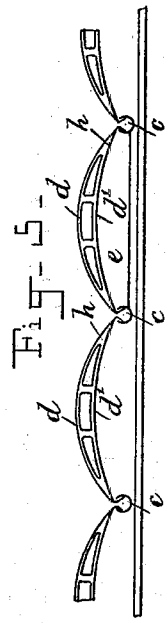
(Application filed Nov. 21, 1898.)

(No Model.) 2 Sheets—Sheet 1.









Witnesses:
John Chalmers Hadden.
Percy C. Bowen.

Inventor:
E. L. Pease,
by Wilkinson & Fisher,
Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

No. 624,857. Patented May 9, 1899.

E. L. PEASE.

ROOF.

(Application filed Nov. 21, 1898.)

(No Model.) 2 Sheets—Sheet 2.

Fig. 6.

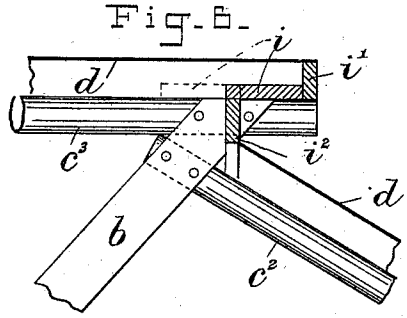


Fig. 7.

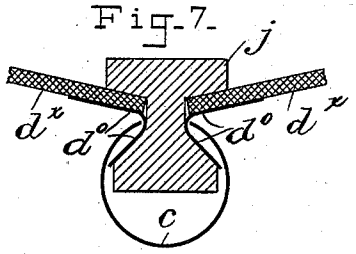


Fig. 8.

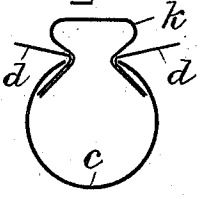


Fig. 9.

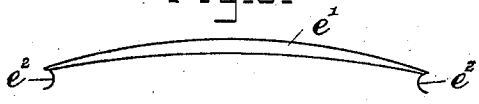


Fig. 10.



Fig. 11.

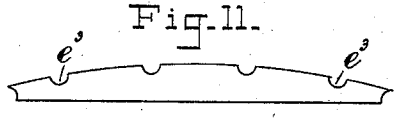


Fig. 13.

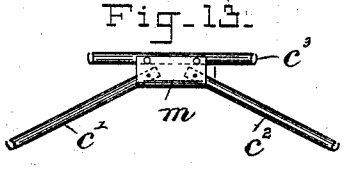


Fig. 12.

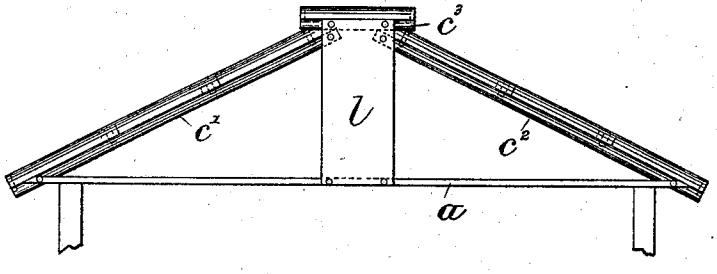


Fig. 14.

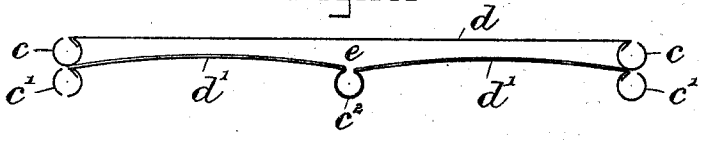


Fig. 16.

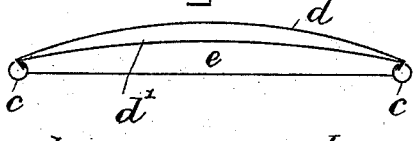
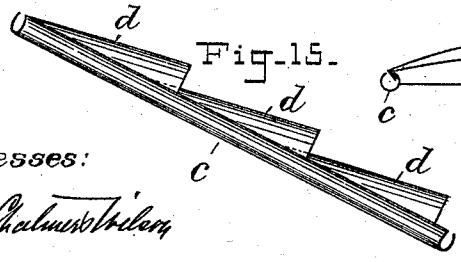


Fig. 15.



Witnesses:

J. H. Chalmers Bolen

Roy C. Bowen

Inventor:

E. L. Pease,

by Wilkinson & Fisher

Attorneys.

THE NORRIS PETERS CO., PHOTO-LITHO., WASHINGTON, D. C.

UNITED STATES PATENT OFFICE.

EDWARD LLOYD PEASE, OF HURWORTH MOOR, ENGLAND.

ROOF.

SPECIFICATION forming part of Letters Patent No. 624,857, dated May 9, 1899.

Application filed November 21, 1898. Serial No. 697,057. (No model.)

To all whom it may concern:

Be it known that I, EDWARD LLOYD PEASE, a subject of the Queen of Great Britain and Ireland, residing at Hurworth Moor, in the county of Durham, England, have invented certain new and useful Improvements in Roofs and Like Structural Work; and I do hereby declare the following to be a full, clear, and exact description of the invention, such as will enable others skilled in the art to which it appertains to make and use the same.

This invention relates to structural work of a kind which is especially adapted for the principals of roofs, including the means of covering the roof in by the use, as hereinafter described, of stretchers in conjunction with sheets with returned edges and slotted tubes, whereby a structure is made in which the shell-covering is combined with the framework and produces great strength with extreme simplicity and lightness. The cambered stretchers being driven in after the sheets are engaged with the tubular members, the sheets are placed in tension and the struts in compression, with the result that the principals are greatly strengthened, it being impossible for them to twist under an endwise force, which owing to their slotted condition they are otherwise liable to do. By the simple means of the stretchers and the returned edges the slotted tubes, while being extremely well adapted for use in these structures, are to a great extent supplied with the strength which is a feature of an ordinary tube. A rounded form in the bays gives the roof or wall great strength diagonally, and in this they resemble buckle-plate girders.

The various novel features constituting the invention will be understood from the following description, which refers to its application to roofs only, as shown in the accompanying drawings, in which—

Figure 1 is a front elevation of a roof-principal constructed in accordance with my invention; and Fig. 2 is a transverse sectional view of the upper member of the roof, showing the sheet-covering engaging with the tubes by means of inset edges. Fig. 3 is a similar view to Fig. 1, showing a roof-principal of larger span; and Fig. 4 is a transverse sectional view of a bay, taken on line $x\,x$ of Fig. 3. Fig. 5 illustrates in detail a double-paneled roof construction. Fig. 6 illustrates an enlarged detail fragmentary sectional view of the upper horizontal member and one of the sloping members, showing their manner of connection. Fig. 7 is a sectional view illustrating the use of a spacing-beam for closing the slot in the tubular rafters; and Fig. 8 is a view similar to Fig. 7, illustrating the substitution of an angular strip of sheet metal for the wooden beam shown in Fig. 7. Fig. 9 illustrates in side elevation a stretcher or stiffener of sheet metal for fitting between the tubular rafters, and Fig. 10 is a cross-sectional view of the said stretcher. Fig. 11 illustrates in side elevation a solid stretcher for lined roofs, showing apertures for air-passages. Fig. 12 is a view similar to Figs. 1 and 3, illustrating the construction of a small roof; and Fig. 13 is a view illustrating a slight modification of the structure shown in Fig. 12. Fig. 14 illustrates a roof construction composed of two sets of panels of different width. Fig. 15 illustrates a modification in the shape and manner of arrangement of the covering-panels, and Fig. 16 illustrates an arrangement of panels of differing convexity.

Referring to Figs. 1 and 2, in its simplest form the roof consists of the main tie-bar a, extending across the span, and central diverging struts $b\ b$, which are preferably of timber or ordinary bars extending to these elements in the structure, which serve the purpose of rafters and which consist of slotted tubes $c'\ c^2$ of the kind described in the specification of my Letters Patent No. 540,186. These slotted tubes may extend to meet and form the ridge of the roof or may stop short, being connected by a horizontal member composed of crosswise tubular bars c^3 and presenting the form of a truncated triangle. These crosswise tubular bars c^3, which I will term "ridge-bars," are or may be secured to the timber-struts $b\ b$, the tubular rafters $c'\ c^2$ being similarly connected thereto. The joint is made, preferably, by two struts, one on each side of the tubes, the whole being combined by through-bolts. It will now be seen that this combination of structural elements makes up a roof-principal of the ordinary girder type. Several of these principals are lined along the walls of the building and upon them is placed the covering material.

This consists of panels d with inset edges d' d^2, threaded into and interlocked with the tubular beams c c, or when panels of other material than metal are used, as shown at $d^\times$ $d^\times$ in Fig. 7, angle-strips d^0 d^0 can be used instead of inset flanges for the same purpose, constituting in this respect a structural arrangement similar to that described in the specification of my Letters Patent No. 613,599, dated November 1, 1898. The slotted tubular beams c c serve as troughs for draining the roof, and in combination with the timbers b b, to which they are connected, constitute a system of struts adapted to take the strain of roof-girders and the like structural work. A further advantage incidental to this construction is that stiffening-pieces e, extending from one slotted tube c to another in contact with the panels d, can be fitted to such endwise pressure between the said tubes, as between solid posts, that nothing more is required to keep them in position as permanent stiffeners to the structure. The sheets comprising the panels d are cambered at erection preferably outward. By insertion of the stretches e, as in this position, besides being stiffened and rendered freer from local deflections they are brought into high tension around the cambered wood or metal stretchers e, and the principals are in this way very firmly held together. They are firmly strutted apart by the stretchers, which being driven in and supplied with a suitably-hollowed end cannot easily be dislodged.

Figs. 3 and 4 illustrate a roof-principal of larger span, which may be made of more than three jointed lengths, as hereinbefore described with reference to Fig. 1, and the two lengths c' c^2 and c^3 c^4 may be parallel, the space f, formed between the two levels, being used for ventilation, if desired. These tubular beams c' c^2 c^3 c^4 c^5 are secured to the struts b' b^2 b^3 b^4, the tie-bars g g being similarly connected thereto by through-bolts.

Fig. 5 illustrates a double-paneled roof construction in which the slotted tubes c c of a cylindrical or other hollow form are placed horizontally at suitable intervals across the span to be covered. Into these slotted tubes are interlocked, by inset flanges or angle-strips, two panels d d', an upper and lower panel having a different curvature, and thereby forming a crescent-shaped space between them, supported where necessary by partitions h, in which openings are provided for ventilation. In roofs of a considerable span the upper or raised panel or sheet d would occupy and cover the central width of the span and derive its support at either end from the lower panels or sheets d', which it overlaps endwise and which cover the side widths of the span, as shown in Fig. 14; but where the two panels overlap or run together their edges are coincident, so that both sheets are interlocked with the same slotted tube c or by inset flanges fitting and hooking together along the edge of the slotted tube, as shown in Figs. 5 and 16, and this construction may be stiffened by stretchers e, if desired; but I do not confine the use of the above-described combination of stretcher and panels to the horizontal section of the roof only, as the roof may consist of the two usual sides converging to a ridge, the place of which is taken by a series of panels, the sides being made up of other panels set the requisite slope and overlapping or given a taper, as required by the general design of the roof in question.

Fig. 6 illustrates an enlarged detail view showing the panels in section, each at the uppermost portion of its curve, and particularly the connection between one side of an upper horizontal member c^3 with one of the sloping members c^2. The construction is arranged to afford means of ventilation, the horizontal panel d being closed at its end by the timber i', cut to the required shape, and the upper end of the sloping panel d being closed by timber i^2, leaving a horizontal space between the lower edge of the upper timber i' and the upper edge of the lower timber i^2, which is closed by means of a movable board or timber i, which lies flat upon the horizontal members c^3 and may be slid outward to cover said space, as shown in full lines, or slid inward to uncover such space and allow ventilation, as shown in dotted lines in said Fig. 6.

Referring to Fig. 7, in order to effect a more rigid connection between the slotted tubes c and the panels hooked into them, by which greater strength and rigidity are imparted to the structure as a whole and the main joints are closed in wholly or to any desired extent and the external appearance of the structure is improved, I provide for each joint as formed by the combination of the opposite edges of adjoining panels and the slotted tube c, with which they are interlocked, a distance-piece j, running the whole length of the joint, or a series of distance-pieces placed at intervals. This distance-piece takes a form not unlike a double-headed rail modified in section to form a fit between the inset flanges, or, as in Fig. 7, the angle-strips d^0 of the adjoining panels, which are thereby forced into tight and rigid contact with the slotted tube c.

Referring to Fig. 8, in substitution for the double-headed beam j of wood equivalents may be used—as, for instance, a strip of sheet iron or steel k, molded or shaped to the form of a rail-head, with the sides or webs constricted and set out to follow the contour of the inset flanges of the panels between which they are inserted, so that a tight and rigid contact is set up, as before, between the panels d and the slotted tube c, with which they are interlocked.

Where metal stretchers are used, they are formed as shown in Fig. 9, the transverse section shown in Fig. 10 representing the bead e', which diminishes toward the ends. These stretchers are furnished with suitably-hollowed ends e^2, which cannot easily be dis-

lodged when fixed in position between the tubes.

Where the roof is lined, the stretcher is placed entirely at the back of the lining and grooved at e^3, as shown in Fig. 11, to admit of the passage of air at the back of the said lining.

In the roof of a smaller building the system I adopt may be carried out as illustrated in Fig. 12, in which the slotted tubes c' c^2 c^3 are connected to two pieces of board l l, one on either side of the tubes and furnished with or without the tie-rod a, the whole being combined by through-bolts, or the boards l may be substituted by the iron strip m. (Shown in Fig. 13.)

Referring to Fig. 14, which illustrates in transverse section a roof construction in which the top part or panels d of the roof may be flat and the lower panels d' cambered, or vice versa, the two sets of panels need not have the same width, the intermediate tube c^2 being supported by the stretcher e. In some cases I use tapered sheets or panels d for ventilation, as shown in Fig. 15, and two panels d d^2 of different rises in the tube may also be used for ventilation, as shown in Fig. 16.

It must be understood that I attach no special importance to the particular arrangement of those parts which are not novel in themselves, such as the tie-bars a and g and struts b, as shown in Figs. 1 and 3, which are examples only of suitable constructions of roof-principals embodying my invention in respect of the essential features of combining with such struts and tie-bars the slotted tubular members d; but

What I claim as new, and desire to secure by Letters Patent, is—

1. In the construction of roofs and other structural arrangements, the combination with longitudinally-slotted tubes, of panels having flanges interlocked therewith; and stiffeners inserted between the said slotted tubes creating tension upon said panels interlocked therewith, substantially as described.

2. In the construction of roofs and other structural arrangements having slotted tubular rafters or the like tubular elements in the framework thereof the combination with longitudinally-slotted tubes of panels interlocked therewith by inset edges or angle-strips, and stiffeners such as e inserted between the said slotted tubes whereby tension is imparted to the panels and rigidity to the general structure substantially as described.

3. In the construction of roofs having slotted tubular rafters the combination with said rafters of upper and under panels d and d' interlocked therewith by inset edges the said panels being of a different curvature to inclose a crescent-shaped space, supported by partitions h and preferably by stiffeners e substantially as described.

4. In the construction of roofs, the combination with slotted tubular rafters, of inner and outer panels of different curvature having edge flanges interlocked with said rafters, substantially as described.

5. In the construction of roofs, the combination with slotted tubular rafters, of inner and outer panels of different curvature, having edge flanges interlocked with said rafters; and spacing pieces or partitions between said inner and outer panels, substantially as described.

6. In the construction of roofs, the combination with slotted tubular rafters, of inner and outer panels having edge flanges interlocked with said rafters; and stiffeners inserted between said slotted tubes and creating tension upon said panels, substantially as described.

7. In the construction of roofs, the combination with slotted tubular rafters, of inner and outer panels of differing curvature, having edge flanges interlocked with said rafters; and stiffeners inserted between slotted tubes and creating tension upon said panels, substantially as described.

8. In the construction of the roof or walls of buildings, the combination with tubular members slotted longitudinally, of panels having inset edge flanges interlocked with said tubular members and distance-pieces fitting between said flanges, of adjoining panels, and partially within the slotted tubular member and partially without the structure, substantially as described.

9. In the construction of the roof or walls of buildings, the combination with tubular members slotted longitudinally, of panels having inset edge flanges interlocked with said tubular members and distance-pieces having a narrow longitudinal portion abutting against the said inset flanges, and having a widened portion lying within the tubular member and another widened portion lying outside the panel and extending over the adjacent edges of two adjoining panels, substantially as described.

In testimony whereof I affix my signature in presence of two witnesses.

EDWARD LLOYD PEASE.

Witnesses:
GEORGE JAMES CLARKSON,
EDWARD THOMAS ELCOAT.